WHAT IS CLAIMED IS:

1. A method for detecting anomalies on a surface; comprising the steps of:

directing a focused beam of light at a grazing angle towards said surface;

causing relative motion between the beam and the surface so that the beam scans a scan path covering substantially the entire surface, said path including a plurality of arrays of scan path segments, wherein each of at least some of such scan path segments has a span shorter than the dimensions of the surface; and

collecting light scattered along said path for detecting anomalies.

2. The method of claim 1, wherein said directing step directs said beam to illuminate an area of the surface defining a spot having a spot size whose minimum width is in the range of about 5 to 15 microns.

3. The method of claim 2, said surface being that of a semiconductor wafer, wherein the spot size and said directing and causing steps are such that the beam substantially inspects the entire surface of the wafer at a throughput in excess of about 40 wafers per hour for 150 mm diameter wafers, at a throughput in excess of about 20 wafers per hour for 200 mm diameter wafers, and at a throughput in excess of about 10 wafers per hour for 300 mm diameter wafers.

4. The method of claim 2, wherein the scan path segments comprise a plurality of straight scan path segments, wherein said directing and causing steps are such that the beam substantially inspects said surface along said scan path segments at such speed that the

surface is inspected along said scan path segments at a speed not less than about 2.5 cm^2/s.

5. The method of claim 4, wherein the spot size and said directing and causing steps are such that the beam substantially inspects said surface along said scan path segments at such speed that the surface is inspected along said scan path segments at a speed in a range of about 2.5 to 3.8 cm^2/s.

6. The method of claim 2, wherein the spot size and said directing and causing steps are such that the beam substantially inspects said surface at such speed that the surface is inspected at a speed not less than about 1.5 cm^2/s.

7. The method of claim 6, wherein the spot size and said directing and causing steps are such that the beam substantially inspects said surface at such speed that the surface is inspected at a speed in the range of about 1.5 to 5 cm^2/s.

8. The method of claim 2, said surface having dimensions of not less than 200 mm in any direction along the surface, wherein the spot size and said directing and causing steps are such that the beam scans substantially the entire surface in about 50 to 90 seconds.

9. The method of claim 2, said method employing an acousto-optic deflector for deflecting the light beam in order to scan said surface, said method further comprising expanding the optical beam before it is deflected by the deflector, so that the beam before

deflection has at least one cross-sectional dimension in the range of about 4 to 12 mm.

10. The method of claim 1, wherein the scan path segments comprise a plurality of arrays of substantially parallel and straight scan path segments, wherein the segments are substantially in a range of about 2-10 mm long.

11. The method of claim 1, wherein said directing step directs said beam to illuminate an area of the surface defining a spot, said beam having an intensity distribution in reference to two axes across the spot, said method further comprising taking a number of samples of the light scattered from any anomaly, if any, in the spot along each of the two axes, said number being in the range of 2 to 10.

12. The method of claim 1, wherein said directing step is such that the angle between the beam and normal direction to the surface is in the range of about 10 to 85 degrees.

13. The method of claim 12, wherein said directing step is such that the angle between the beam and normal direction to the surface is in the range of about 50 to 80 degrees.

14. The method of claim 1, said method employing an acousto-optic deflector for deflecting the light beam in order to scan said surface, said directing and causing steps including driving the deflector with a linear FM chirp signal with a center frequency in the range of 50 to 300 MHz.

15. The method of claim 1, said method employing an acousto-optic deflector for deflecting the light beam in order to scan said surface, said directing and causing steps including driving the deflector with a linear FM chirp signal with a bandwidth in the range of 50 to 250 MHz.

16. The method of claim 15, further comprising supplying a linear FM chirp signal to drive the acousto-optic deflector so that the chirp duration is in the range 20 to 200 microseconds.

17. The method of claim 15, further comprising supplying a linear FM chirp signal to drive the acousto-optic deflector so that the chirp duration is in the range of about 80 to 120 microseconds.

18. The method of claim 1, said method employing an acousto-optic deflector for deflecting the light beam in order to scan said surface, said method further comprising providing a scan lens substantially at one focal length away from the deflector and between the deflector and the surface so that the beam scans the surface telecentrically.

19. The method of claim 1, said method employing a polygon scanner for deflecting the light beam in order to scan said surface, said method further comprising providing a scan lens substantially at one focal length away from the deflector and between the deflector and the surface so that the beam scans the surface telecentrically.

20. The method of claim 1, said collecting step collecting light scattered along said scan path in the forward direction azimuthally.

21. The method of claim 20, said collecting step collecting light scattered along said scan path using four independent collection channels, two of said collection channels located in the forward direction to collect light in the forward direction substantially at ±45° azimuthally and two of the channels are located to collect light substantially at ±90° azimuthally.

22. The method of claim 21, each of said collection channels collects light in the range of 3 to 30° in the elevation direction, said channels collecting light in the respective ranges of azimuthal angles of -(75-105)°, (75-105)°, -(30-60)° and (30-60)°.

23. The method of claim 1, said method further comprising selecting a desired polarization state of a light beam that is directed in the directing step from S state, P state, or a circular polarization state.

24. A method for detecting anomalies on a surface of a semiconductor wafer; comprising:

directing a focused beam of light towards said surface to illuminate an area of the surface defining a spot having a spot size whose minimum width is in the range of about 5 to 15 microns;

causing relative motion between the beam and the wafer so that the beam scans a path covering substantially the entire surface; and

collecting light scattered along said path for detecting anomalies;

wherein the spot size and said directing and causing steps are such that the beam substantially inspects the entire surface of the wafer at a throughput in excess of about 40 wafers per hour for 150 mm diameter wafers, at a throughput in excess of about 20 wafers per hour for 200 mm diameter wafers, and at a throughput in excess of about 10 wafers per hour for 300 mm diameter wafers.

25. A method for detecting anomalies on a surface; comprising the steps of:

directing a focused beam of light towards said surface to illuminate an area of the surface defining a spot having a spot size whose minimum width is in the range of about 5 to 15 microns;

causing relative motion between the beam and the surface so that the beam scans a path covering substantially the entire surface; and

collecting light scattered along said path for detecting anomalies;

wherein the spot size and said directing and causing steps are such that the surface is inspected at a speed not less than about 1.5 cm^2/s.

26. A method for detecting anomalies on a surface; comprising the steps of:

directing a beam of light towards said surface to illuminate an area of the surface defining a spot having a spot size whose minimum width is in the range of about 5 to 15 microns;

causing relative motion between the beam and the surface so that the beam scans a path covering substantially the entire surface; and

collecting light scattered along said path for detecting anomalies;

said surface having dimensions of not less than 200 mm in any direction along the surface, wherein said directing and causing steps are such that the beam scans substantially the entire surface in about 50 to 90 seconds.

27. A system for detecting anomalies on a surface; comprising:

means for directing a focused beam of light at a grazing angle towards said surface;

means for causing relative motion between the beam and the surface so that the beam scans a scan path covering substantially the entire surface, said path including a plurality of arrays of scan path segments, wherein each of at least some of such scan path segments has a span shorter than the dimensions of the surface; and

means for collecting light scattered along said path for detecting anomalies.

28. The system of claim 27, wherein said directing means directs said beam to illuminate an area of the surface defining a spot having a spot size whose minimum width is in the range of about 5 to 15 microns.

29. The system of claim 28, said surface being that of a semiconductor wafer, wherein the spot size and said directing and causing means are such that the beam substantially inspects the entire surface of the wafer at a throughput in excess of about 40 wafers per hour for 150 mm diameter wafers, at a throughput in excess of about 20 wafers per hour for 200 mm diameter wafers, and at a throughput in excess of about 10 wafers per hour for 300 mm diameter wafers.

30. The system of claim 28, wherein the scan path segments comprise a plurality of straight scan path segments, wherein the spot size and said directing and causing means are such that the beam substantially inspects said surface along said scan path segments at such speed that the surface is inspected along said scan path segments at a speed not less than about 2.5 cm^2/s.

31. The system of claim 30, wherein the spot size and said directing and causing means are such that the beam substantially inspects said surface along said scan path segments at such speed that the surface is inspected along said scan path segments at a speed in a range of about 2.5 to 3.8 cm^2/s.

32. The system of claim 28, wherein the spot size and said directing and causing means are such that the beam substantially inspects said surface at such speed that the surface is inspected at a speed not less than about 1.5 cm^2/s.

33. The system of claim 32, wherein the spot size and said directing and causing means are such that the beam substantially inspects said surface at such speed that the surface is inspected at a speed in the range of about 1.5 to 5 cm^2/s.

34. The system of claim 28, said surface having dimensions of not less than 200 mm in any direction along the surface, wherein the spot size and said directing and causing means are such that the beam scans substantially the entire surface in about 50 to 90 seconds.

35. The system of claim 28, said system employing an acousto-optic deflector for deflecting the light beam in order to scan said surface, said system further comprising expanding the optical beam before it is deflected by the deflector, so that the beam before deflection has at least one cross-sectional dimension in the range of about 4 to 12 mm.

36. The system of claim 27, wherein the scan path segments comprise a plurality of arrays of substantially parallel and straight scan path segments, wherein the segments are substantially in a range of about 2-10 mm long.

37. The system of claim 27, wherein said directing means directs said beam to illuminate an area of the surface defining a spot, said beam having an intensity distribution in reference to two axes across the spot, said system further comprising taking a number of samples of the light scattered from any anomaly, if any, in the spot along each of the two axes, said number being in the range of 2 to 10.

38. The system of claim 27, wherein said directing means is such that the angle between the beam and normal direction to the surface is in the range of about 10 to 85°.

39. The system of claim 38, wherein said directing means is such that the angle between the beam and normal direction to the surface is in the range of about 50 to 80°.

40. The system of claim 27, said system employing an acousto-optic deflector for deflecting the

light beam in order to scan said surface, said directing and causing means including driving the deflector with a linear FM chirp signal with a center frequency in the range of 50 to 300 MHz.

41. The system of claim 27, said system employing an acousto-optic deflector for deflecting the light beam in order to scan said surface, said directing and causing means including driving the deflector with a linear FM chirp signal with a bandwidth in the range of 50 to 250 MHz.

42. The system of claim 41, further comprising means for supplying a linear FM chirp signal to drive the acousto-optic deflector so that the chirp duration is in the range 20 to 200 microseconds.

43. The system of claim 41, further comprising means for supplying a linear FM chirp signal to drive the acousto-optic deflector so that the chirp duration is in the range of about 80 to 120 microseconds.

44. The system of claim 27, said system employing an acousto-optic deflector for deflecting the light beam in order to scan said surface, said system further comprising a scan lens substantially at one focal length away from the deflector and between the deflector and the surface so that the beam scans the surface telecentrically.

45. The system of claim 27, said system further comprising:

a polygon scanner for deflecting the light beam in order to scan said surface; and

a scan lens substantially at one focal length away from the deflector and between the deflector and the surface so that the beam scans the surface telecentrically.

46. The system of claim 27, said collecting means collecting light scattered along said scan path in the forward direction azimuthally.

47. The system of claim 46, said collecting means comprising four independent collection channels collecting light scattered along said scan path, two of said collection channels located in the forward direction to collect light in the forward direction substantially at $\pm 45^\circ$ azimuthally and two of the channels are located to collect light substantially at $\pm 90^\circ$ azimuthally.

48. The system of claim 47, each of said collection channels collects light in the range of 3 to 30° in the elevation direction, said channels collecting light in the respective ranges of azimuthal angles of $-(75\text{-}105)^\circ$, $(75\text{-}105)^\circ$, $-(30\text{-}60)^\circ$ and $(30\text{-}60)^\circ$.

49. The system of claim 27, said system further comprising selecting a desired polarization state of a light beam that is directed in the directing means from S state, P state, or a circular polarization state.

50. A system for detecting anomalies on a surface of a semiconductor wafer; comprising:

means for directing a focused beam of light towards said surface to illuminate an area of the

surface defining a spot having a spot size whose minimum width is in the range of about 5 to 15 microns;

means for causing relative motion between the beam and the wafer so that the beam scans a path covering substantially the entire surface; and

means for collecting light scattered along said path for detecting anomalies;

wherein the spot size and said directing and causing means are such that the beam substantially inspects the entire surface of the wafer at a throughput in excess of about 40 wafers per hour for 150 mm diameter wafers, at a throughput in excess of about 20 wafers per hour for 200 mm diameter wafers, and at a throughput in excess of about 10 wafers per hour for 300 mm diameter wafers.

51. A system for detecting anomalies on a surface; comprising the means of:

means for directing a focused beam of light towards said surface to illuminate an area of the surface defining a spot having a spot size whose minimum width is in the range of about 5 to 15 microns;

means for causing relative motion between the beam and the surface so that the beam scans a path covering substantially the entire surface; and

means for collecting light scattered along said path for detecting anomalies;

wherein the spot size and said directing and causing means are such that the surface is inspected at a speed not less than about 1.5 cm^2/s.

52. A system for detecting anomalies on a surface; comprising the means of:

means for directing a beam of light towards said surface to illuminate an area of the surface

defining a spot having a spot size whose minimum width is in the range of about 5 to 15 microns;

means for causing relative motion between the beam and the surface so that the beam scans a path covering substantially the entire surface; and

means for collecting light scattered along said path for detecting anomalies;

said surface having dimensions of not less than 200 mm in any direction along the surface, wherein the spot size and said directing and causing means are such that the beam scans substantially the entire surface in about 50 to 90 seconds.